Topic test 13 Further algebra

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 8 free-response questions (60 marks)

Name: _____

Part A

20 multiple-choice questions
2 marks each: 40 marks
Circle the correct answer.

1 The highest common factor of 24 and 44 is:
A 2 B 4
C 8 D 11

2 Two numbers with a sum of 15 and a product of 56 are:
A 14 and 4 B 8 and 7
C 9 and 6 D 13 and 2

3 Two numbers with a sum of 10 and a product of -24 are:
A 4 and -6 B -6 and 4
C -12 and 2 D -2 and 12

4 Expand $2(4u + 1) - (u - 1)$.
A $7u + 1$ B $9u + 1$
C $5u + 3$ D $7u + 3$

5 Expand $x(x - 5) + 3(x - 5)$.
A $x^2 - 2x - 15$ B $x^2 - 8x - 15$
C $x^2 + 2x - 8$ D $x^2 - 8x - 8$

6 Expand $(x + 2)(x + 3)$.
A $x^2 + 6$ B $x^2 + 5$
C $x^2 + 6x + 5$ D $x^2 + 5x + 6$

7 Expand $(w - 4)^2$.
A $w^2 + 16$ B $w^2 - 16$
C $w^2 - 4w + 16$ D $w^2 - 8w + 16$

8 An example of a difference of two squares is:
A $y^2 - 3$ B $y^2 - 6y + 9$
C $y^2 - 9$ D $y^2 - 9y$

9 Expand $(p + 6)(p - 2)$.
A $p^2 + 4p - 4$ B $p^2 - 4p - 4$
C $p^2 + 4p - 12$ D $p^2 - 4p - 12$

10 Expand $(2y - 10)(2y + 10)$.
A $4y^2$ B $4y^2 - 100$
C $4y^2 - 40y + 100$ D $4y^2 + 40y + 100$

11 Factorise $28m^2 - 32m$.
A $2(14m - 16)$ B $2m(14m - 16)$
C $4m(7m - 8)$ D $4(7m^2 - 8m)$

12 Factorise $x^2 - 36$
A $(x + 18)(x - 18)$ B $(x - 6)(x + 6)$
C $(x - 6)^2$ D $(x - 36)(x + 1)$

13 Expand $(k - 6)(k - 10)$.
A $k^2 - 4k + 16$ B $k^2 - 4k - 16$
C $k^2 - 16k + 60$ D $k^2 - 16k - 60$

14 If $(7g + 3)^2 = 49g^2 + \square g + 9$, what is the value of $\square$?
A 20 B 21
C 14 D 42

15 Expand $(2u + 6)(2u - 4)$.
A $8u + 2$ B $-4u^2 + 12u - 24$
C $4u^2 + 4u - 24$ D $4u^2 - 4u - 24$

16 Factorise $x^2 + x + 2xy + 2y$.
A $2(x + 1)(x + y)$ B $(x + 2)(x + y)$
C $(x + 1)(x + 2y)$ D $x(x + 2y + 3)$

17 If one factor of $x^2 + 9x + 14$ is $(x + 2)$, then the other factor is:
A $x + 7$ B $x - 7$
C $x + 12$ D $x - 12$

18 Expand $\left(a + \frac{1}{a}\right)^2$.
A 1
B $a^2 + \frac{1}{a^2}$
C $a^2 + \frac{1}{a^2} + 1$
D $a^2 + \frac{1}{a^2} + 2$

19 Simplify $\frac{3x+6}{12}$.

A $\frac{x+6}{4}$ **B** $\frac{x+3}{4}$

C $\frac{3x+1}{2}$ **D** $\frac{x+2}{4}$

20 Factorise $2m^2 + 11m + 5$.

A $(m+1)(2m+5)$ **B** $(2m+1)(2m+5)$

C $(2m+1)(m+5)$ **D** $2(m+1)(m+5)$

Part B

8 free-response questions
60 marks
Show working where appropriate.

21 (12 marks) Expand and simplify each of these expressions.

a $-2(m-9)$

b $(t+7)(t-7)$

c $(x-12)(x-3)$

d $(y+7)(y-2)$

e $(5e+2)(5e-2)$

f $(x-y)^2$

22 (2 marks) Find the value of 22×18 without using a calculator, by expanding $(20+2)(20-2)$.

23 (12 marks) Factorise each of these expressions.

a $16 - w^2$

b $-6k - 36$

c $x(x-4) + 7(x-4)$

d $x^2 + 13x + 30$

e $2r(r+3) + r + 3$

f $3y^2 - 27$

24 (12 marks) Expand and simplify each expression.

a $(3d+5)(2d+6)$

b $(r+9)^2$

c $(2x-5)(3x+7)$

d $(7y-10)^2$

25 (2 marks) Find the value of 45^2 without using a calculator, by expanding $(40 + 5)^2$.

END OF TEST.
Use the rest of this page and the back for extra working space.

26 (8 marks) Factorise each expression.

a $a^3 - a$

b $49y^2 - 100z^2$

c $px - 2x + ap - 2a$

d $f^2 - 11f + 28$

27 (3 marks) Simplify $\dfrac{6r^2 - 24rt}{9}$.

28 (9 marks) Factorise each expression.

a $2b^2 + b - 1$

b $6a^2 + 5a + 1$

c $12x^2 - 24x + 9$

Topic test 13 Further algebra

- Time allowed: 45 minutes
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- Part B: 8 free-response questions (60 marks)

Name: David Ong

Need more practice with quadratics!

Part A

20 multiple-choice questions
2 marks each: 40 marks
Circle the correct answer.

1 The highest common factor of 24 and 44 is:
A 2 ✓(B) 4
C 8 D 11

2 Two numbers with a sum of 15 and a product of 56 are:
A 14 and 4 ✓(B) 8 and 7
C 9 and 6 D 13 and 2

3 Two numbers with a sum of 10 and a product of -24 are:
A 4 and -6 B -6 and 4
(C) 12 and 2 (D) -2 and 12

4 Expand $2(4u+1)-(u-1)$.
A $7u+1$ B $9u+1$
C $5u+3$ ✓(D) $7u+3$

5 Expand $x(x-5)+3(x-5)$.
✓(A) $x^2-2x-15$ B $x^2-8x-15$
C x^2+2x-8 D x^2-8x-8

6 Expand $(x+2)(x+3)$.
A x^2+6 B x^2+5
C x^2+6x+5 ✓(D) x^2+5x+6

7 Expand $(w-4)^2$.
A w^2+16 B w^2-16
C $w^2-4w+16$ ✓(D) $w^2-8w+16$

8 An example of a difference of two squares is:
A y^2-3 B y^2-6y+9
✓(C) y^2-9 D y^2-9y

9 Expand $(p+6)(p-2)$.
A p^2+4p-4 B p^2-4p-4
✓(C) $p^2+4p-12$ D $p^2-4p-12$

10 Expand $(2y-10)(2y+10)$.
A $4y^2$ (B) $4y^2-100$
C $4y^2-40y+100$ D $4y^2+40y+100$

11 Factorise $28m^2-32m$.
A $2(14m-16)$ B $2m(14m-16)$
✓(C) $4m(7m-8)$ D $4(7m^2-8m)$

12 Factorise x^2-36
A $(x+18)(x-18)$ ✓(B) $(x-6)(x+6)$
C $(x-6)^2$ D $(x-36)(x+1)$

13 Expand $(k-6)(k-10)$.
A $k^2-4k+16$ B $k^2-4k-16$
✓(C) $k^2-16k+60$ D $k^2-16k-60$

14 If $(7g+3)^2=49g^2+\square g+9$, what is the value of $\square$?
A 20 B 21
C 14 ✓(D) 42

15 Expand $(2u+6)(2u-4)$.
✓(A) $8u+2$ B $-4u^2+12u-24$
✓(C) $4u^2+4u-24$ D $4u^2-4u-24$

16 Factorise $x^2+x+2xy+2y$.
A $2(x+1)(x+y)$ B $(x+2)(x+y)$
✓(C) $(x+1)(x+2y)$ D $x(x+2y+3)$

17 If one factor of $x^2+9x+14$ is $(x+2)$, then the other factor is:
✓(A) $x+7$ B $x-7$
C $x+12$ D $x-12$

18 Expand $\left(a+\frac{1}{a}\right)^2$.
A 1
B $a^2+\frac{1}{a^2}$
C $a^2+\frac{1}{a^2}+1$
✓(D) $a^2+\frac{1}{a^2}+2$

19 Simplify $\frac{3x+6}{12}$.

A $\frac{x+6}{4}$ B $\frac{x+3}{4}$

C $\frac{3x+1}{2}$ ✓ D $\frac{x+2}{4}$

20 Factorise $2m^2+11m+5$.

A $(m+1)(2m+5)$ B $(2m+1)(2m+5)$

✓ C $(2m+1)(m+5)$ D $2(m+1)(m+5)$

Part B

8 free-response questions
60 marks
Show working where appropriate.

21 (12 marks) Expand and simplify each of these expressions.

a $-2(m-9)$
$-2m+18$ ✓

b $(t+7)(t-7)$ $t(t-7)+7(t-7)$
t^2 $t^2-7t+7t-49$
t^2-49 ✓

c $(x-12)(x-3)$ $x(x-3)-12(x-3)$
$x^2-3x-12x+36$
$x^2-15x+36$ ✓

d $(y+7)(y-2)$ $y^2+5y-14$

e $(5e+2)(5e-2)$ $25e^2-4$ ✓

f $(x-y)^2$ $x^2-2xy+y^2$ ✓

22 (2 marks) Find the value of 22×18 without using a calculator, by expanding $(20+2)(20-2)$.
$20(20-2)+2(20-2)$
$400-40+40-4$
396 ✓

23 (12 marks) Factorise each of these expressions.

a $16-w^2$
$(4-w)(4+w)$ ✓

b $-6k-36$
$-6(k+6)$ ✓

c $x(x-4)+7(x-4)$
$(x+7)(x-4)$ ✓

d $x^2+13x+30$
$(x+3)(x+10)$ ✓

e $2r(r+3)+r+3$
$2r^2+6r+r+3$
$2r^2+7r+3$ ✓

f $3y^2-27$
$3(y^2-9)$
$3(y-3)(y+3)$ ✓

24 (12 marks) Expand and simplify each expression.

a $(3d+5)(2d+6)$
$6d^2+18d+10d+30$
$6d^2+28d+30$ ✓

b $(r+9)^2$
$r^2+18r+81$ ✓

c $(2x-5)(3x+7)$
$6x^2+14x-15x-35$
$6x^2-x-35$ ✓

d $(7y-10)^2$
~~$49y^2-100$~~
$49y^2-70y-70y+100$
$49y^2-140y+100$

Topic test 13: Further algebra *continued*

25 (2 marks) Find the value of 45^2 without using a calculator, by expanding $(40 + 5)^2$.

$40(40+5)+5(40+5)$

$1600+200+200+25$ ✓

2025 ✓

END OF TEST.

Use the rest of this page and the back for extra working space.

26 (8 marks) Factorise each expression.

a $a^3 - a$

$a(a^2-1)$

$a(a-1)(a+1)$ ✓

b $49y^2 - 100z^2$

$(7y-10z)(7y+10z)$ ✓

c $px - 2x + ap - 2a$

$x(p-2)+a(p-2)$ ✓

$(x+a)(p-2)$ ✓

d $f^2 - 11f + 28$

~~$(x-7)(x-4)$~~

$(f-7)(f-4)$

27 (3 marks) Simplify $\frac{6r^2 - 24rt}{9}$ $\frac{2\times3\times(r-4t)}{3\times3}$ $\frac{2r(r-4t)}{3}$ ✓

28 (9 marks) Factorise each expression.

a $2b^2 + b - 1$ $2b$ -1 b $+1$

$2b+-b$

$(2b-1)(b+1)$ ✓

Please ask me!

b $6a^2 + 5a + 1$

$a=6\ b=5\ c=1$

$S=5,\ P=6$

$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$\frac{-5\pm\sqrt{5^2-4\times6\times1}}{2\times6}$ ✗

$\frac{-5\pm\sqrt{25-24}}{6}$

$\frac{-5\pm1}{6}$ → $\frac{-6}{6}$ or $\frac{-4}{6}$

-1 or $-\frac{4}{6}$

c $12x^2 - 24x + 9$

$a=12\ b=-24\ c=9$

$\frac{24\pm\sqrt{24^2-4\times12\times9}}{2\times12}$ ✗

$\frac{24\pm\sqrt{576-432}}{24}$

24 ± 12

$\frac{36}{24}$ or $\frac{12}{24}$

$\frac{3}{2}$ or $\frac{1}{2}$